3.06 No must carry obligations are attached to local delivery licences. It is for the franchisee to determine which channels he wishes to carry, in accordance with paragraph 3.03 above.

Changes in ownership

3.07 Any significant change of ownership will need to be notified to the ITC and the ITC will need to assure itself that the restrictions on ownership continue to be observed. Subject to this, the ITC does not expect to exercise a restrictive control on takeovers and acquisitions. Significant changes in shareholding must also be notified to the DTI if a licensee is licensed under Section 8 of the Telecommunications Act 1984 and has Code powers.

Variation of licences

3.08 The ITC has power under the Act to vary a licence but must give the licensee a reasonable opportunity to make representations before doing so.

Enforcement of licences

3.09 If a licensee fails to comply with any condition of a licence the ITC has power to impose financial penalties of an amount up to 3% of qualifying revenue for the previous financial year, or, on a second case of breach in the licence period, of up to 5% of qualifying revenue. Where the ITC considers it justified, and where it is satisfied that it would have been reasonably practicable for the licence holder to comply with the condition of which breach has occurred, there is power to revoke the licence.

Provision of information

3.10 Licensees will be required to submit regular accounts and projections, and to make records available, so that the ITC will be in a position to estimate, assess and advise the licensee of the tender payments due.

3.11 Having regard to projections of qualifying revenue provided and updated by the licensee on a regular basis, the ITC will estimate the payment to be made in respect of the percentage of qualifying revenue. The ITC will, however, use its own estimate if it feels it appropriate to do so. Payment will be made by equal monthly instalments. On receipt of audited accounts, and after its own inspections of the accounts and records of the licensee, the ITC will send to the licensee a computation showing its assessment of the full tender amount for the year and any balance due or refundable. Full details of the arrangements will be given in a Statement of Principles on Qualifying Revenue to be published by the ITC after consultation with the Secretary of State and the Treasury.

3.12 Other information, in a form prescribed by the ITC, may be required on a regular basis, or from time to time, including the provision of Income and Expenditure returns at six monthly intervals.

PART IV - LICENSING REQUIREMENT UNDER THE TELECOMMUNICATIONS ACT 1984

Requirement for a Telecommunications Act Licence

4.01 Any system used to deliver a local delivery service is a "telecommunication system" under the Telecommunications Act 1984. As such, anyone running such a system requires a licence under that Act. The Broadcasting Act 1990 has removed the previous exception from licensing under the Telecommunications Act of broadcasting by wireless telegraphy for general reception. Thus, both cable and MVDS systems will require a Telecommunications Act licence.

4.02 Telecommunications Act licences will be issued by the Department of Trade and Industry to whoever is running the system over which a local delivery service is delivered. In most cases this will be the holder of the local delivery service licence itself although it could be to another party if the local delivery licensee has contracted that other party to run the system.

Duration of licences

4.03 The Telecommunications Act licence for a local delivery system will run in parallel to that issued by the Commission and thus, typically, initially for 15 years. As under the previous regime, however, the Telecommunications Act licence may enter into force before the local delivery service starts, in order to allow the operator to instal his system. In those circumstances the two licences will generally be timed to expire on the same date. A Telecommunications Act licence may still be available if the operator wishes to provide telecommunications services other than local delivery services beyond the date on which authorisation to provide the latter ends..

Terms and Conditions of the Licence

4.04 The terms and conditions of each Telecommunications Act licence including, in particular, the extent of services authorised and the existence, or not, of powers under the Telecommunications Code, will vary according to the nature of the local delivery system proposed. The following guidelines may be helpful:

(a) Telecommunications Code powers will not be granted in respect of a system unless it could not reasonably be built without them. They are thus unlikely to be granted in respect of SMATV or for those systems relying solely on MVDS;

(b) systems capable of carrying comprehensive two-way services will be licensed to do so.

Authorisation

4.05 The extent of the authorisation to provide telecommunication services will depend on the system. A system capable of comprehensive two-way services will be authorised to provide such services in the same way as a broadband cable franchisee, including the provision of voice telephony services under certain conditions. MVDS systems will be authorised to convey local delivery services by wireless telegraphy. Unlike under the previous regime an operator running a system capable of providing two-way services but covering fewer than 10,000 homes will be authorised to provide all the services that broadband systems have previously been authorised to provide.

Coverage and service obligation

4.06 Coverage may be by cable, MVDS or a combination of the two. A licensee may be required to satisfy reasonable demands for certain telecommunication services, including the conveyance of local delivery services, from anyone within an area in which his system has been built.

Technical and Safety Requirements

4.07 All licensed systems will be required to satisfy certain technical and safety requirements, including those related to radio interference. Broadband cable systems will also be required to conform to those BSI and other standards which apply to such systems and any attachments to them. They will also be required to be installed in such a way that they can be upgraded to provide voice telephony services without the need to be reconfigured.

Particular conditions applying to broadband cable systems

4.08 In order to be eligible for powers under the Telecommunications Code, licensees running two-way broadband cable systems will need to have further conditions in their licences so that section 8 of the Telecommunications Act can apply. The most important of these are certain requirements to connect to other systems and to allow services carried on those connected systems to be provided via the licensee's own system if a customer so requests.

4.09 Local delivery operators who provide voice telephony services are subject to further conditions such as the obligation to provide 999 and directory information services and to supply suitable apparatus for the hearing impaired.

Other conditions

4.10 Licences for local delivery systems, other than one-way SMATV systems, will also contain conditions such as those on metering systems and numbering which are contained in existing broadband cable licences.

Licence fee

4.11 For 1993/94 the fee for issue of a licence conferring Telecommunications Code powers would normally be £12,500. Licences not conferring Code powers would normally cost £1,100. The higher fee for licences with Code powers reflects the much greater costs, including in particular the costs of the statutory consultation on the terms of the licence required under the Telecommunications Act. Annual renewal fees will also be charged. Initially (1993) these will be £2,500 in the case of licences with Code powers, and £1,250 for SMATV or MVDS-only licences, or, in each case, a sum not exceeding 0.08% of the annual turnover of the Licensee's Systems Business where that sum is the greater.

Revocation

4.12 Licences may be revoked with the agreement of the licensee or if the licensee persistently breaks licence conditions, becomes insolvent or otherwise ceases to trade or no longer holds a local delivery service licence from the Commission. They may also be revoked if there is a change of ownership or control of the licensee which in the opinion of the Secretary of State is against the interests of national security or relations with a foreign government. Non-payment of an annual renewal fee is also grounds for revocation of a Telecommunications Act licence.

4.13 The Director General of Oftel has powers to modify conditions in licences granted under the terms of the Telecommunications Act, except those relating to the application of the Telecommunication Code, with the consent of the licensee and following statutory consultation. If he wishes to modify a licence condition without the licensee's consent, he can refer the case to the Monopolies and Mergers Commission (MMC).

PART V - LICENSING REQUIREMENTS UNDER THE WIRELESS TELEGRAPHY ACT 1949

Requirement for a Wireless Telegraphy Licence

5.01 Any local delivery service which uses radio to distribute its services in any part of the franchise area will require a licence under the Wireless Telegraphy Act 1949 for the establishment and use of the wireless telegraphy stations. This licence is additional to the licence required under the Broadcasting Act 1990 and the Telecommunications Act 1984.

5.02 Wireless Telegraphy Licences will be issued by the Radiocommunications Agency of the Department of Trade and Industry to whoever establishes and uses the wireless telegraphy stations. As with the Telecommunications Act Licence, in most cases the holder of the local delivery service licence will be the WT Licensee, though if the operation of the wireless telegraphy stations has been contracted to a third party it would be the licensee.

Prior examination of application for Wireless Telegraphy Licence

5.03 A Wireless Telegraphy Licence will only be issued if there is radio spectrum available in the proposed area of operation which can be used without causing undue interference to others and without itself being unduly interfered with. Applicants proposing to use wireless telegraphy will need to provide the information referred to in paragraph 5.05 below so that the Secretary of State can determine this matter, and advise the ITC (in accordance with Section 75(2)(a) of the Broadcasting Act) prior to the award of a licence under the Broadcasting Act.

5.04 The proposed use of radio needs to be examined before the issue of a licence to ensure that there would be no interference to other users of the radio spectrum and to ensure that the proposed service would not be interfered with by others. The Radiocommunications Agency will check that this would be so, prior to advising the ITC that the technical plan is feasible. If the technical plan appears to be feasible and if the application to the ITC is successful, the Radiocommunications Agency will award the WT licence authorising the use of particular frequencies from particular sites at specified power levels etc. A provisional channel plan for maximising the use of the 40GHz band is contained in Annex 1 - this plan is not mandatory but potential applicants may wish to discuss informally with the Radiocommunications Agency any suggested variance in advance of making their application.

Information required

5.05 In order to carry out the necessary checks relating to the proposed use of radio, the application should include:

i) details of the proposed sites of all WT transmitters (quoting National Grid references of sites or latitude and longitude);

ii) the height of the site(s) (expressed in metres above mean sea level), and the proposed heights of antennas (expressed in metres above ground level);

iii) the proposed frequencies, power levels, polarisation of emissions, and the radiation patterns envisaged from each antenna.

Duration of licences

5.06 The Wireless Telegraphy Act Licence will run in parallel with that issued by the ITC - typically in the first instance for 15 years, unless in the meanwhile it lapses or is otherwise revoked. Additional time may be provided at the start of the licence period to allow the operator to test the installation.

Terms and conditions of the Wireless Telegraphy Licence

5.07 The licence will permit the licensee to establish and use specified transmitters within the franchise area. The licence will lay down the authorised parameters for such operations - based on the information provided in accordance with paragraph 5.05 above. Once issued the WT licence would permit the operation of the proposed stations, subject to any modifications which might be necessary to avoid undue interference.

5.08 The terms of the licence will require the licensee to ensure that the WT apparatus is designed, constructed, maintained and used so that it does not cause any undue interference to any other radio operators. A performance specification for transmitters (MPT 1550) is available from the Radiocommunications Agency and the licence will require compliance with the specification. The licensee will be required to permit agents of the Secretary of State to have access to any WT station to verify compliance with the terms of the licence or to investigate radio interference problems. If necessary the licensee must close down any station which is operating in breach of the licence.

Licence fee

5.09 A Wireless Telegraphy licence fee is payable annually (in advance). The fee reflects the costs of issuing and enforcing the licence (including making frequencies available to local delivery operators at particular locations, monitoring the frequency and dealing with interference problems). Failure to pay the licence fee on or before the due date leads automatically to termination of the licence.

5.10 The initial annual fee for a WT licence is shown in the following table:

Total number of homes in franchise area	WT Licence Fee
up to 50,000	£ 8,000
50,001 to 150,000	£16,000
150,001 to 250,000	£24,000
250,001 to 350,000	£32,000
350,001 to 450,000	£48,000

5.11 For a new service, such as MVDS, it is naturally difficult to predict all the costs precisely at the outset, and it is possible that in future years the fees (and indeed the whole fee structure) might need to be revised in the light of experience. Should any significant change be envisaged, the Radiocommunications Agency will consult licensees before any change is finalised.

Revocation

5.12 Licences may be revoked by the Secretary of State in accordance with Section 1(4) of the Wireless Telegraphy Act. Notice of such revocation would be given to the licensee in writing or by a general notice published by means of an authorised broadcast and/or an insertion in the London, Edinburgh and Belfast Gazettes.

A Provisional Channel Plan for MVDS

Horizonal polarisation		Vertical polarisation	
Channel Number	Nominal Centre frequency of channel (GHz)	Channel Number	Nominal Centre frequency of channel (GHz)
1	40.53500	2	40.54975
3	40.56450	4	40.57925
5	40.59400	6	40.60875
7	40.62350	8	40.63825
9	40.65300	10	40.66775
11	40.68250	12	40.69725
13	40.71200	14	40.72675
15	40.74150	16	40.75625
17	40.77100	18	40.78575
19	40.80050	20	40.81525
21	40.83000	22	40.84475
23	40.85950	24	40.87425
25	40.88900	26	40.90375
27	40.91850	28	40.93325
29	40.94800	30	40.96275
31	40.97750	32	40.99225
33	41.00700	34	41.02175
35	41.03650	36	41.05125
37	41.06600	38	41.08075
39	41.09550	40	41.11025
41	41.12500	42	41.13975
43	41.15450	44	41.16925
45	41.18400	46	41.19875
47	41.21350	48	41.22825
49	41.24300	50	41.25775
51	41.27250	52	41.28725
53	41.30200	54	41.31675
55	41.33150	56	41.34625
57	41.36100	58	41.37575
59	41.39050	60	41.40525
61	41.42000	62	41.43475
63	41.44950	64	41.46425

Horizontal polarisation		Vertical polarisation	
Channel Number	Nominal Centre frequency of channel (GHz)	Channel Number	Nominal Centre frequency of channel (GHz)
65	41.53500	66	41.54975
67	41.56450	68	41.57925
69	41.59400	70	41.60875
71	41.62350	72	41.63825
73	41.65300	74	41.66775
75	41.68250	76	41.69725
77	41.71200	78	41.72675
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117	42.30200	118	42.31675
119	42.33150	120	42.34625
121	42.36100	122	42.37575
123	42.39050	124	42.40525
125	42.42000	126	42.43475
127	42.44950	128	42.46425

ANNEX 2.1

PRO FORMA: PROFIT & LOSS PROJECTIONS (1994 PRICES)

Gross Revenue	Calendar Yr in which licence (i.e. service) begins £'000	Etc	Calendar Yr in which licence ends £'000
Programme Services Revenue:			
Subscriptions			
Pay-per-view			
Related equipment charges			
Advertising revenue			
Other service delivery related revenue			
Installation Charges			
Other programme services revenue			
TOTAL PROGRAMME SERVICES REVENUE			
Telecom Services Revenue:			
Rental			
Call charges			
Installation charges			
Interconnection revenue			
Other service-related revenue			
TOTAL TELECOM SERVICE REVENUE			
Other revenue			
TOTAL REVENUE			

PRO FORMA: PROFIT & LOSS PROJECTIONS (Continued)
(1994 PRICES)

	Calendar Yr in which licence begins £'000	Etc	Calendar Yr in which licence ends £'000
Costs			
Cost of programmes			
Telecom interconnection costs			
Network operations			
Sales and marketing			
Administration			
Depreciation and leasing			
Overheads			
Other operating costs			
Operating Profit			
Additional payments (percentage of qualifying revenue)			
Investment income and interest receivable			
Interest payable			
Other items			
Profit before cash bid and tax			
Cash Bid			
Dividends			
Tax			

ANNEX 2.2

PRO-FORMA: CASH FLOW PROJECTIONS

(1994 PRICES)

	1994 Q1 £'000	1994 Q2 £'000	Etc	2011 £'000
Trading Receipts				
- Programme services				
Telecom services				
Other income				
Interest receivable				
VAT				
Total				
Trading Payments				
Programme costs				
Interconnection costs				
Percentage of qualifying revenue				
Other operating costs				
Interest payable				
VAT				
Total				
Net Trading Receipts				

PRO-FORMA: CASH FLOW PROJECTIONS (Continued)

(1994 PRICES)

	Year 1 Q1 £'000	Year 1 Q2 £'000	Etc	2011 £'000
Other Receipts				
Share capital				
Loan drawdowns				
Other				
Total				
Other Payments				
Fixed asset additions (net)				
Development expenditure				
Loan repayments				
Other				
Tax, cash bid and dividends				
Total				
Net Cash Inflow/(Outflow)				
Opening Cash Balance				
Closing Cash Balance				
Balance of available finance (incl. borrowing facilities)				

ANNEX 3

APPLICATION FOR A LOCAL DELIVERY LICENCE

THE CASH BID

Franchise area: .....

Name of applicant: .....

Cash bid: £.....

We offer to pay the sum above as our cash bid in accordance with Section 77 of the Broadcasting Act 1990 for the franchise specified.

This is the amount which, if our application is successful, will be paid in the first complete calendar year of the licence period and is also to be paid, but indexed in accordance with Section 74(7) of the Act, in respect of each subsequent year or part thereof falling within the licence period.

We recognise that these amounts supplement any sums payable as a result of the percentages of qualifying revenue specified by the ITC in accordance with Section 74(1)(d)(ii) of the Act.

Dated

Signed

Director/Secretary
Duly authorised on behalf of the applicant

CEPT Recommendation T/R 52-01 E concerning the designation of a Harmonised Frequency Band for MVDS in Europe

(adopted by the European Radiocommunications Committee, Athens 1990)

Television-programme distribution by microwave can be achieved by means of a Multipoint Video Distribution System (MVDS). A typical MVDS consists of a microwave transmitter connected to an omni-directional or sector antenna, which covers a number of receivers located at the subscribers' premises at fixed locations. The system transmits a large number of channels (typically 20) via microwave to the individual subscriber. In some countries, MVDS is regarded as an alternative to cable television distribution networks; in others it is considered an extension to these networks. A harmonised frequency band for MVDS in Europe allows quick technical development of equipment for it. The CEPT, considering that:

1. in Europe MVDS should have the capability to distribute at least 20 channels to provide an equivalent service to cable networks;
2. an AM system uses an 8 MHz channel spacing, whereas an FM system also capable of transporting HD-MAC signals requires a channel spacing of about 40 MHz, thus per cell at least 160 or 800 MHz should be available depending on the modulation method chosen;
3. more frequency blocks are required for frequency coordination between cells;
4. the resulting large bandwidth cannot be made available throughout Europe in the lower frequency ranges and thus a selection has to be made considering the higher frequency bands only;
5. the choice for the higher frequency bands necessitates the use of FM and involves specific problems such as the short range covered (with current technology less than 5 km) and that therefore, in general, systems used for the extension of cable networks can successfully use this part of the spectrum;
6. several bands in the higher frequency range have been suggested such as the 29, 38, 42 and 60 Ghz bands, that the lowest of these bands potentially offer the highest performance while the highest is unsuitable because of the very limited range (less than 1km);
7. the 40.5 - 42.5 GHz band has been allocated by the ITU on a primary basis to the broadcasting-satellite service, on a permitted basis to the broadcasting service and on a secondary basis to the fixed and mobile services;
8. no systems are operational or planned and that satellite-broadcasting systems are not expected to be operational in this band before the year 2010;
9. the band 40.5 - 42.5 GHz offers a sufficient amount of spectrum for MVDS.

Noting:

that in some countries there is a need to use substantially lower frequency bands for systems which have to provide a much wider coverage

Recommends:

that the band 40.5 - 42.5 GHz shall be the harmonized frequency band for Multipoint Video Distribution Systems in Europe.

Towns not covered by cable franchises

At the conclusion of the broadband franchising programme the following towns remain outside cable franchise areas and are potential Local Deliver Franchise areas:

Over 20,000 homes:

Belfast	Blackpool	Burton On Trent
Carlise	Chesterfield	Crewe
Dunfermline	Eastbourne	Hastings
Haywards Heath	Hinckley	Hull
Lisburn	Londonderry	Scunthorpe
Shrewsbury	Southport	Tamworth
Thanet	Tunbridge Wells	
Dorchester/Weymouth/Portland		

Other significant towns:

Ashington	Ayr	Banbury
Bangor (Co Down)	Barrow	Barry
Bexhill	Bognor	Boston
Braintree	Bridgewater	Bridlington
Bury St Edmunds	Cambourne	Canterbury
Chichester	Clacton	Colwyn Bay
Dumfries	Fleetwood	Hereford
Herne Bay	Horsham	Inverness
Kilmarnock	Lancaster	Llanelli
Lytham St Annes	Malvern	Merthyr Tydfil
Morecambe	Northwich	Scarborough
Stirling	Taunton	Tonbridge
Whitehaven	Whitstable	Workington
Worksop	Wrexham	Yeovil

Appendix E

A Provisional Channel Plan for MVDS

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123	42.39050	124	42.40525
125	42.42000	126	42.43475
127	42.44950	128	42.46425

Summary of 40 GHz MVDS Technical Parameters

Modulation	Frequency Modulation
Polarisation	Linear: Vertical/Horizontal
Typical transmit antenna gain	Omnidirectional: 8 dBi Sectoral 64°: 15 dBi
Receive antenna gain	27 - 33 dBi
Receive antenna polarisation discrimination	> 20 dB
Receive antenna pointing error for ± 1.5 degree misalignment	1 - 2 dB
Typical receiver noise figure	9 - 12 dB
Carrier to Noise (C/N) ratio to be exceeded for all but 1% worst month	12 dB
Carrier to Interference (C/I)	26 - 30 dB
Intermediate frequency tuning range of the indoor unit	950 - 2000 MHz
Number of channels proposed	Four channel groups of 32
Typical range using a sectoral horn transmit antenna	4 km
Frequency re-use distance	20 - 30 km
Rain attenuation for all but 1% worst month (7 mm/h)	2.1 dB/km
Protection ratio	Co-channel 31 dB Adjacent channel 15 dB
Transmitter power per channel	20 - 23 dBm

Typical Link Budgets for 40 GHz MVDS Omnidirectional and Sector Coverage Antennas

	Omni	Sectoral
Transmitter power	-7.0 dBW	-7.0 dBW
Transmit antenna gain	8.0 dBi	15.0 dBi
EIRP	1.0 dBW	8.0 dBW
Free space attenuation (2 km omni; 4 km sectoral)	131.0 dB	137.0 dB
Atmospheric loss (0.1 dB/km)	0.2 dB	0.4 dB
Rainfall attenuation (2.1 dB/km)	4.2 dB	8.4 dB
Total attenuation	135.4 dB	145.8 dB
Receiver antenna gain	32.0 dBi	32.0 dBi
Receive antenna pointing error ± 1.5 degrees	-2.0 dB	-2.0 dB
Received carrier level	-104.4 dBW	-107.8 dBW
KTB (Receiver bandwidth 27 MHz)	-129.6 dBW	-129.6 dBW
Receiver noise figure	9.0 dB	9.0 dB
Noise output level	-120.6 dBW	-120.6 dBW
Carrier to Noise (C/N) ratio	16.2 dB	12.8 dB

The C/N ratios achieved using the omnidirectional and sector coverage antennas, at 2 and 4 km path lengths respectively, both meet our quality criterion of 12 dB for 1% worst month. Therefore this ensures at least CCIR grade 4 picture quality.

Glossary of Terms and Abbreviations used in the Report

AFC - Automatic frequency control
ATTENUATION - The general term for a decrease in the magnitude of a signal resulting from its transmission through any medium. Numerically, attenuation may be expressed as the scalar ratio of the received power to the transmitted power. Usually, however, it is expressed as ten times the logarithm of that ratio - see **DECIBEL**.

BASEBAND - The band of frequencies which contains the signal(s) used to modulate a carrier immediately prior to transmission.
BREMA - British Radio Electronic Manufacturers Association.

CCIR - International Radio Consultative Committee (of the ITU).
CEPT - Conference of European Postal and Telecommunications Administrations.
CLOSED LOOP FREQUENCY CONTROL - A method of controlling the frequency of the output of a system to reduce the difference between the desired and actual frequency.
C/N - Carrier to Noise ratio.
C/I - Carrier to Interference ratio.

DBS - Direct Broadcasting by Satellite.
DECIBEL (dB) - a dimensionless, logarithmic unit equal to one tenth of a BEL. The decibel is thus one-tenth of the common logarithm of a number expressing a ratio of two powers, and we may write $10\text{Log}_{10}\ (P_1/P_2)$. This unit is a measure for the overall loss or gain in power attributable to a circuit or device.
DIODE (eg varactor) - device which allows current to flow through it in one direction only.
DISCRIMINATION (CROSS-POLAR (XPD) OR AZIMUTHAL) - The selection of a signal having a particular characteristic by the elimination or reduction of all other signals.

EBU - European Broadcasting Union.
EEA - Electronic Engineering Association.
EIRP - Equivalent Isotropically Radiated Power.
ENERGY MASK - A mask below which all the energy should fall.

FILTER - Device which controls the range of frequencies that passes through a circuit.
FINLINE - Distributed circuit technology.

GUN DIODE - A doped gallium arsenide diode.
GUNN OSCILLATOR - An oscillator which uses a Gun diode.

HEMT - High Electron Mobility Transistor.

ITU - International Telecommunications Union.

kTB - Noise bandwidth (k - Boltzmanns constant 1.38×10^{-23};
T - Temperature; B - Bandwith (Hz)).

LNA - Low Noise Amplifier.
LNB - Low Noise Block downconverter. A means of amplifying weak signals received at the antenna and converting them from 40 GHz to intermediate frequencies which can be handled by co-axial cable and receiver.

MAC - Multiplexed Analogue Components. A tv transmission format.
MIXER - Device/circuit used to mix the signal from the LNB with an oscillator produced signal in order to further reduce signal frequency to that of a tv channel in the UHF band. Tuning in stations involves adjusting the local oscillator frequency.
MULTIPATH - Attenuation caused by radio waves arriving at the receiver via direct and reflected paths out of phase with each other.
MULTIPLEXING - The carrying of many messages on a single transmission channel.
MONOLITHIC CIRCUITS - A single chip with several sub-systems performing a number of functions. Monolithic production techniques offer a route to low cost mass production of MVDS components such as amplifiers and oscillators.

NF - Noise Figure.

OSCILLATOR - A circuit which produces a voltage output at a chosen frequency.

PAL - Phase Alternation by Line. A tv transmission format.
PCN - Personal Communications Network.
POLARISATION - A fundamental property of a wave characterised by the direction of the electric field.

SECTORAL HORN - A type of transmission or receiving antenna.
SIDEBANDS - Further signals which arise when a carrier signal is modulated by a second signal.
SMATV - Satellite to Master Antenna Television.

VSB - Vestigial Sideband Modulation. A means of economising on the power and bandwidth required to transmit a tv signal.

WAVEGUIDE - A transmission medium in which radio waves are propagated along hollow tubes (either Rectangular, Circular or Elliptical)
WARC - World Administrative Radio Conference

Zin - Input impedance